

# HARDINGE



Maintenance and  
Operation Manual

for

High Speed Precision  
Tool Room Lathe



## INSTRUCTIONS FOR OPERATION

OF

# HARDINGE TL PRECISION TOOL ROOM LATHE

### DESCRIPTION OF DETAILS

Unfold Illustration, Page 13, for Detail Numbers

#### ELECTRIC CONTROL LEVER FOR MOTOR — Detail 1

The electric control lever for motor is used to start and stop the machine spindle. When the lever is in the center position, as shown in the illustration, the motor is off and the mechanical brake is applied. By moving this lever to the left of center, the mechanical brake is released and the motor operates at the low motor speed. Moving the lever to the right of center releases the brake and the motor operates at the high motor speed. When operating the machine at the low motor speed, the spindle speed may be instantly doubled by moving the electric control lever to the right of center. To stop the spindle, move the lever to the center position—this turns off the motor and applies the brake.

#### LEVER FOR CARRIAGE — Detail 2

The lever for carriage controls the power feed rod and lead screw. When this lever is in the center or neutral position as shown in the illustration, all gears except the reversing gears are mechanically disconnected from the headstock spindle. By placing this lever to the left of center, the carriage will move toward the headstock. Placing this lever to the right of center, the carriage will move toward the tailstock. The movements of the carriage are the same when using either the power feed or lead screw.

NOTE: The lever for carriage should always be engaged in either the right or left-hand position, so that, when revolving the headstock spindle by hand, the gear shifting handles described under details 4 and 5 may be easily positioned.

CAUTION: DO NOT USE THIS LEVER WHEN THE SPINDLE IS RUNNING IN REVERSE AS THE STOP ROD WILL NOT OPERATE — SEE DETAIL 11.

#### HANDWHEEL — Detail 3

The handwheel is provided to facilitate turning the spindle by hand when inspecting or setting up work. In setting up work which requires that the spindle be rotated by hand, place the reverse lever (Detail 9) in the center or "off" position and the electric control lever (Detail 1) for motor in either the high or low speed position. This releases the mechanical brake and the spindle can be rotated freely. To obtain an absolute free spindle without gear, belt or brake action, pull the spindle gear (Detail 6) to left.

thus removing it from mesh with other gears in the gear box and release the spindle pulley by moving the pin release handle (Detail 27) to the left until a "click" is heard. By using this method of obtaining a free spindle, more accurate balancing of face plate work can be obtained. The handwheel is also used as an index for cutting multiple threads. The back side is graduated in divisions and marked for cutting 2, 3 and 4 start threads, as further described under Detail 6.

#### THREE-CHANGE HANDLE — Detail 4

The three-change handle has three positions. The handle as shown is in position number "3". By moving the handle to the left of center, position number "2" is obtained and by moving the lever to the right of center, position number "1" is obtained. The numbers 1, 2 and 3 refer to the gear box thread and feed chart and are shown in the vertical column at the extreme left of the chart. Therefore, to obtain a desired pitch, position the three-change handle so that the number on the handle is directly above the arrow on the gear box chart. The three-change handle also controls three speed changes of the stud outside the gear box. For example, if change gears are set up to cut 15 pitch threads with the three-change handle at position number "1", the same change gear set-up will cut 30 and 60 pitch threads by moving the three-change handle to positions "2" and "3" respectively.

NOTE: The three-change handle may be positioned more easily if the lever for carriage (Detail 2) is engaged and the spindle rotated by hand as referred to under Detail 2.

**CAUTION: DO NOT SHIFT GEARS WHILE MACHINE IS RUNNING.**

#### TEN-CHANGE HANDLE — Detail 5

The ten-change handle has an "out" or disconnect position at the extreme right which is used when the change gears are set up outside the gear box. The other ten positions are for a wide variety of feeds and thread selections. To operate, pull the knob out and move the ten-change handle to line up with the desired pitch of thread or feed per revolution shown on the chart and allow the tapered plunger to seat. When positioning this handle, do not try to force it to engage the gears, but rotate the spindle by hand, using the handwheel with the lever for carriage engaged as outlined under Detail 2. The oil cup in this handle should be filled once a day and preferably when the handle is in its highest position or extreme left.

#### SPINDLE GEAR — Detail 6

The spindle gear is a sliding gear with two positions. When the gear is in the position shown in the illustration, it is in mesh with the gear box gears and supplies power for the lead screw or power feed rod. By sliding this gear to the left until it strikes a positive "out" position stop, the gear box is then disconnected from the headstock spindle. The sliding spindle gear has 48 teeth which are divisible by 2, 3 and 4 for cutting multiple threads. To cut a multiple thread, select the pitch desired, and cut the first

lead to depth. Then, turn the spindle handwheel so that the desired division for the thread to be cut is opposite the line on the gear box. After the spindle is positioned, slide the spindle gear to the left until it is out of mesh with the gear box. Rotate the handwheel until the next division being used is opposite the line on the gear box, then slide the spindle gear to the right into mesh with the gear box. Repeat this process for each lead of the multiple thread.

NOTE: When cutting multiple threads always rotate or index the spindle in the same direction as the work rotates. When indexing, have the lever for carriage (Detail 2) engaged and the lead screw nut engaged with the lead screw.

#### DRAW SPINDLE HANDLE — Detail 7

The draw spindle handle is provided for ease in closing and opening collets and is notched for the use of the standard Hardinge spanner wrench.

NOTE: Always remove the draw spindle when not holding in a collet or center.

#### COVER FOR CHANGE GEARS — Detail 8

The cover for change gears is a guard covering change gears used to cut threads not obtainable with the quick change gear box or when a metric attachment is used. A set of eight change gears is furnished as standard equipment with each machine. Five of the gears are placed on the gear stud and bracket. The other three gears are shipped separately.

To cut a ten-pitch thread, for example, place the ten-change handle (Detail 5) in the "out" position, remove the cover for change gears, compound the necessary gears as shown on the gear chart in this book and then position the three-change handle (Detail 4) in number "2" position. As explained under Detail 4, by changing the three-change handle, three pitches may be cut with each change gear set up. For example, when set up for ten pitch, by shifting the handle, five, ten and twenty pitches may be cut.

NOTE: Slow back gear speeds should be used when cutting 10 pitch threads or coarser.

#### REVERSE LEVER — Detail 9

The reverse lever is connected to a reversing drum controller. The lever has three positions, "Forward, Stop or Off, and Reverse." The lever as shown in the illustration is in the Forward position and, by moving the lever to the left, the "Stop or Off" position is reached. By going still further to the left, the controller is placed in the reversing position. Each position has locating stops for rapid placing of the lever.

#### CONTROL COVER — Detail 10

The electric controls for "LOW-STOP-HIGH" and for "FORWARD-STOP-REVERSE" are located under this cover. Loosen two screws and remove cover for cleaning, inspection or repairing controls.

### **MICROMETER STOP — Detail 11**

The micrometer stop will be found very useful when threading dead against a shoulder or for turning and boring under the same conditions. The micrometer stop should always be used when threading. The micrometer stop consists of a stop rod running the entire length of the lathe bed, two adjustable stop collars, a safety collar and a graduated barrel. To use the micrometer stop, first position the adjustable stop collars on the stop rod to give the desired length of the thread to be cut or the longitudinal turning out. This is accomplished by running the carriage back and forth under power of either the lead screw or power feed rod, depending upon which is to be used, until each stop is properly set. For final fine adjustment of the stop, loosen the knurled thumb screw next to the graduated barrel and move the barrel the desired amount for correct stop setting, then tighten the thumb screw to lock the stop rod. The adjustable collars referred to are described under Detail 12. The safety collar is described under Detail 22.

**CAUTION: DO NOT USE THE STOPS WHEN THE SPINDLE IS RUNNING IN REVERSE. DO NOT CHANGE SPINDLE SPEEDS AFTER THE STOPS HAVE BEEN SET. CHANGING THE SPINDLE SPEED WILL CHANGE THE STOP LENGTH. IF A CHANGE IN SPINDLE SPEED IS NECESSARY, RE-CHECK THE CARRIAGE STOP POSITION.**

### **ADJUSTABLE STOP COLLAR — Detail 12**

There are two adjustable stop collars, one on each side of the carriage apron. These collars are adjustable along the stop rod and are locked in place with a set screw.

### **LONGITUDINAL FEED HANDLE — Detail 13**

The longitudinal feed handle is of the "finger-tip" type carriage feed control. When the handle is in the position shown in the illustration, the feed is disconnected. By moving this lever toward the operator or away from the apron, the feed is engaged.

### **FEED ROD ENGAGEMENT — Detail 14**

The feed rod engagement handle is used to connect and disconnect the power feed rod from the carriage apron gears. When the handle is in the position shown in the illustration, the power feed rod gear is connected to the apron gears. By moving this handle to the left, the feed rod gear and the apron gears will be disconnected. The handle should be in the engaged or right-hand position when the longitudinal power feed or cross feed is to be used.

**NOTE:** The lead screw nut handle must be to the extreme left as shown in the illustration when operating the feed rod engagement handle as there is an interlock between these handles to

prevent use of the power feed and lead screw at the same time. Do not use this handle to control power feed cuts as it will be injurious to the gears. Always use the longitudinal feed handle (Detail 13) or cross feed handle (Detail 15).

### **CROSS FEED HANDLE — Detail 15**

The cross feed handle is also of the "finger-tip" type control and operates the same as the longitudinal feed handle. The cross feed, per revolution of the spindle, is approximately one-half of the gear box plate reading.

### **CARRIAGE LOCK — Detail 16**

The carriage lock consists of an eccentric working on the gib, thus pulling the carriage up against the solid back dovetail of the bed. It will lock the carriage at any desired position on the bed.

### **QUICK-ACTING HANDLE — Detail 17**

The quick-acting handle is used when cutting threads. By moving this handle from one stop to the other, the slide will move  $7/64"$  without moving the micrometer dials or feed screws. This quick withdrawal of the tool makes for very rapid thread cutting. (See separate instruction sheet entitled "Screw Cutting" in this book).

### **ONE-EIGHTH GRADUATIONS — Detail 18**

The  $1/8"$  graduations on the tailstock spindle are for controlling the travel of the spindle when drilling or reaming, or any other operation requiring a definite depth of cut.

### **ONE-THOUSANDTH GRADUATIONS — Detail 19**

The  $1/1000"$  graduations are provided for very fine depth control of drilling, reaming or boring with the tailstock.

### **TAILSTOCK CROSS ADJUSTMENT — Detail 20**

From time to time the cross alignment of the tailstock should be checked. The resetting of the tailstock is done by loosening one of the screws and following up with the other.

### **LEAD SCREW NUT HANDLE — Detail 21**

The lead screw nut handle controls the opening and closing of the lead screw nut. When the handle is in the position shown in the illustration, the lead screw nut is open. Move the feed rod engagement handle (Detail 14) to the extreme left to release the interlock between the power feed and lead screw nut. By moving the lead screw nut handle to the extreme right, the lead screw nut will be closed around the lead screw.

### **SAFETY STOP COLLAR — Detail 22**

The safety stop collar is pinned in place on the stop rod to prevent the carriage from striking the end plate of the bed. It automatically disengages the power feed when carriage is fed beyond its limit.

### **THREE-POINT SUSPENSION ADJUSTMENT — Detail 23**

The bed rests on two spherical seats at the headstock end and a steel ball at the tailstock end. This provides an ideal mounting for the precision machine. The steel ball at the tailstock end is provided with an adjustment for proper clearance between the bed feet and pedestal chip pan.

### **GIB ADJUSTING SCREW — Detail 24**

The gib adjusting screw is used for adjusting the carriage gib. The gib is locked in place, after any adjustments, with the screw at the left-hand end of the carriage.

### **TAILSTOCK LOCK HANDLE — Detail 25**

The tailstock can be securely locked any place on the bed by use of this handle.

### **BACK GEAR ECCENTRIC — Detail 26**

The back gear eccentric handle is used to engage and disengage the back gears. When the handle is in the position shown in the illustration, the back gears are in mesh. By moving the lever away from the operator, the gears are out of mesh or disconnected. The handle has a spring plunger for holding the gears out of mesh and the handle should be turned away from the operator until this plunger is engaged. To change from back gear to open belt drive, move the back gear eccentric handle away from the operator until it is in the released position. Then turn the spindle by hand while moving the pin release handle (Detail 27) toward the right until a "click" is heard.

### **PIN RELEASE HANDLE — Detail 27**

The pin release handle connects and disconnects the spindle pulley from the spindle gear of the back gears. By moving this lever to the extreme left until a "click" is heard, the pulley is disconnected. Moving the lever to the extreme right and rotating the headstock spindle by hand until the "click" is heard, the pulley is connected to the spindle gear for open belt use.

### **ADJUSTABLE TAPER TURNING ATTACHMENT — Detail 28**

The taper turning attachment is adjustable along the bed. It has a screw adjustment for fine setting to the graduated base which has both degrees and taper per foot. When using the taper attachment, release the bolt holding the cross slide nut.

### **COLLET SHELF ON DOOR — Detail 29**

This shelf has holes for holding 5C HARDINGE Precision Collets and centers. It is attached to the door and swings out when door is opened.

### **TOOL SHELVES — Detail 30**

Wooden tool shelves are provided for convenient storage of attachments, such as steady rest, jaw chucks and face plates.

### **BELT RELEASE LEVER — Detail 31**

Use this lever for raising the motor for ease of shifting the motor belt.

### **BELT TENSION ADJUSTMENT — Detail 32**

Adjust motor belt with this screw. The motor belt has correct tension when it may be deflexed about 1" between the thumb and forefinger using moderate pressure.

### **BELT ADJUSTMENT BOLTS — Detail 33**

The belt adjustment bolts are provided to allow take-up of belt stretch of the headstock belts.

### **BELT TAKE-UP — Detail 34**

When all adjustment provided by Details 32 and 33 is used up, there is additional take-up provided by this adjustment. Lower the motor plate the desired amount, then lock in place and readjust belt adjusting screws.

# INSTRUCTIONS FOR SCREW CUTTING ON TL HARDINGE PRECISION TOOL ROOM LATHE

The following features incorporated in the TL HARDINGE Precision Tool Room Lathe make this lathe ideal for fast and accurate thread cutting:

1. High speeds possible because of super-precision ball bearing spindle design.
2. Elimination of chatter by Hardinge dovetail bed construction and rigid carriage slides.
3. Quick draw-back mechanism for the threading tool.
4. Micrometer stop for carriage.
5. Reverse motion to carriage without reversing the spindle.
6. No chasing dial required.

Before starting to cut a thread, select the proper cutting speed for the size of thread to be cut. Use the speed that will give the best finish for the particular material being used.

Pick out the desired pitch from gear box instruction plate and place the three-change and the ten-change handles in proper positions.

Set the micrometer stops to stop the carriage at desired place, both going toward and from the head.

Set the tool post slide at desired angle for thread cutting, preferably 29° for 60° threads.

Close the lead screw nut by moving the lead screw nut handle toward the right. (Before this can be done, the power feed must be disengaged as the feed rod engagement handle and the lead screw nut handle are interlocked).

Be sure that the quick-acting handle on the tool post slide is firmly down on the stop at the right.

Feed in tool and start cutting.

At the end of the thread the carriage will stop as governed by the setting of the micrometer stop. At that instant, throw quick-acting handle to the left, withdrawing the tool from the work, and reverse the carriage. After carriage stops on the reverse, throw quick-acting handle down on the stop toward the right and then feed in desired number of thousandths, using either tool post slide or cross slide.

## MULTIPLE THREADS

The handwheel on the spindle is graduated in twelve divisions—marked for turning the spindle one-half, one-third or one-quarter of a turn. By sliding the spindle gear, which has forty-eight teeth, out of mesh, turning the spindle the desired part of a turn and then sliding the gear back into mesh, the correct spacing can be had for cutting double, triple or quadruple threads.

Threads Per Inch	Knob	First Gear	First Gear On Stud	Second Gear On Stud	Screw Gear	Idler
10	2	22	22	60	36	35
11		Gearbox				
11½		Gearbox				
12		Gearbox				
13		Gearbox				
14		Gearbox				
15	1	40	None	30	60	44
16		Gearbox				
17	1	40	24	30	60	44
18		Gearbox				
19	1	40	38	30	60	44
20		Gearbox				
21	1	40	42	30	60	44
22		Gearbox				
23		Gearbox				
24		Gearbox				
25	1	40	58	30	60	38
26		Gearbox				
27		Gearbox				
28		Gearbox				
29	1	40	58	30	60	38
30	2	40	None	30	60	44
31	1	30	31	22	60	44
32		Gearbox				
33	1	30	33	22	60	44
34		Gearbox				
35	1	30	35	22	60	44
36		Gearbox				
37	1	38	37	22	60	44
38	2	48	39	33	60	44
39	1	38	39	22	60	44
40		Gearbox				
41	1	33	41	22	60	44
42	2	43	42	30	60	44
43	1	30	43	22	60	44
44		Gearbox				
45	1	33	45	22	60	44
46		Gearbox				
47	1	38	47	22	60	44
48		Gearbox				
49	1	38	49	22	60	44
50	2	43	50	33	60	38
51	1	33	51	22	60	44
52		Gearbox				
53	1	30	53	22	60	44
54		Gearbox				
55	1	30	55	22	60	44
56		Gearbox				
57	1	30	57	22	60	44
58	2	40	58	20	60	38
59	1	30	59	22	60	44
60	3	40	38	20	60	44
61	2	40	61	30	60	38
62	2	30	38	22	60	44
63	2	40	43	22	60	44
64		Gearbox				
65	2	48	51	22	60	38
66	2	30	33	22	60	44
67	2	40	57	20	60	38
68		Gearbox				
69	2	40	46	22	60	44
70	2	38	35	22	60	44
71	3	50	33	22	71	20
72		Gearbox				
73	3	50	33	22	73	20
74	2	30	37	22	60	44

Threads Per Inch	Knob	First Gear	First Gear On Stud	Second Gear On Stud	Screw Gear	Idler
75	2	40	30	22	60	44
76	3	40	38	30	60	44
77	3	60	38	22	77	20
78	2	30	38	22	60	44
79	3	60	38	22	79	20
Gearbox						
81	3	40	27	22	60	44
82	2	30	41	22	60	44
83	3	60	30	22	83	20
84	3	40	42	20	60	44
85	2	24	36	22	60	44
86	2	30	43	22	60	44
87	3	40	29	22	60	44
88	2	30	44	22	60	44
89	3	60	33	22	89	20
90	2	30	45	22	60	44
91	3	60	33	22	91	20
92	2	30	46	22	60	44
93	3	40	31	22	60	44
94	2	30	47	22	60	44
95	2	34	38	22	60	44
96	2	30	48	22	60	44
97	3	60	35	22	97	20
98	2	30	49	22	60	44
99	3	40	36	22	60	44
100	3	40	50	30	60	38
101	2	30	51	22	60	44
102	2	30	52	22	60	44
103	2	24	42	22	60	44
104	2	30	53	22	60	44
105	2	30	53	22	60	44
106	2	30	53	22	60	44
Gearbox						
108	2	30	55	22	60	44
109	2	30	56	22	60	44
110	2	30	57	22	60	44
111	2	24	46	22	60	44
112	3	40	58	22	60	44
113	2	32	59	22	60	44
114	2	32	60	22	60	44
115	2	30	57	22	60	44
116	3	40	58	22	60	44
117	2	32	59	22	60	44
118	2	32	60	22	60	44
119	3	40	61	22	60	44
120	3	40	61	22	60	44
121	3	40	61	22	60	44
122	3	38	61	22	60	44
123	3	38	61	22	60	44
124	3	38	61	22	60	44
125	2	24	50	22	60	44
126	3	40	48	22	60	44
127	3	40	48	22	60	44
128	3	40	48	22	60	44
129	3	40	48	22	60	44
130	3	40	48	22	60	44
131	3	40	48	22	60	44
132	3	40	48	22	60	44
133	3	40	48	22	60	44
134	3	40	67	20	60	20
135	3	40	45	22	60	44
Gearbox						
136	3	40	46	22	60	44
137	3	40	35	22	60	44
138	3	60	65	22	71	20
139	3	40	43	22	60	44
140	3	40	43	22	60	44
141	3	40	43	22	60	44
142	3	60	66	22	71	20
143	3	40	43	22	60	44
144	3	40	43	22	60	44
145	3	40	48	22	60	44
146	3	60	66	22	73	20
147	3	30	37	22	60	44
148	3	40	50	22	60	44
149	3	40	46	22	60	44
150	3	40	46	22	60	44
151	3	40	46	22	60	44
152	3	40	46	22	60	44
153	3	40	46	22	60	44
154	3	40	46	22	60	44
155	3	40	46	22	60	44
156	3	40	46	22	60	44
157	3	40	46	22	60	44
158	3	40	46	22	60	44
159	3	40	46	22	60	44
160	3	40	46	22	60	44
161	3	40	46	22	60	44
162	3	40	46	22	60	44
163	3	40	46	22	60	44
164	3	40	46	22	60	44
165	3	40	46	22	60	44
166	3	40	46	22	60	44
167	3	40	46	22	60	44
168	3	40	46	22	60	44
169	3	40	46	22	60	44
170	3	40	46	22	60	44
171	3	40	46	22	60	44
172	3	40	46	22	60	44
173	3	40	46	22	60	44
174	3	40	46	22	60	44
175	3	40	46	22	60	44
176	3	40	46	22	60	44
177	3	40	46	22	60	44
178	3	40	46	22	60	44
179	3	40	46	22	60	44
180	3	40	46	22	60	44
181	3	40	46	22	60	44
182	3	40	46	22	60	44
183	3	40	46	22	60	44
184	3	40	46	22	60	44
185	3	40	46	22	60	44
186	3	40	46	22	60	44
187	3	40	46	22	60	44
188	3	40	46	22	60	44
189	3	40	46	22	60	44
190	3	40	46	22	60	44
191	3	40	46	22	60	44
192	3	40	46	22	60	44
193	3	40	46	22	60	44
194	3	40	46	22	60	44
195	3	40	46	22	60	44
196	3	40	46	22	60	44
197	3	40	46	22	60	44
198	3	40	46	22	60	44
199	3	40	46	22	60	44
200	3	40	46	22	60	44
201	3	40	46	22	60	44
202	3	40	46	22	60	44
203	3	40	46	22	60	44
204	3	40	46	22	60	44
205	3	40	46	22	60	44

# OILING INSTRUCTIONS FOR TL HARDINGE PRECISION TOOL ROOM LATHE

**IMPORTANT:** Use only the best grade of white high speed spindle oil for all oiled bearings.

The oil should have a viscosity of 100 at 100°F.

## SPINDLE BEARINGS:

Headstocks having oil cups at the rear of the unit are provided with oil holes filled with felt to assure constant filtered lubrication. On machines where there are no oil cups located at the rear of the headstock, the headstock is equipped with front and rear bearings which are grease packed for life—requiring no further lubrication.

The back gear bearings are of the anti-friction, grease-packed type and are grease-packed and sealed for life. They require no additional lubrication. The back gear cover should be removed occasionally, depending upon the amount of use, and a small amount of grease applied to the gear surfaces.

## GEAR BOX:

All shafts and bevel gears are running on ball bearings of the greased and sealed type and do not require any additional grease.

Oil cups and oilers are for oiling the reversing clutch fork, the three change shifter, the tumbler gear and gears inaccessible through the opening in front of the gear box.

Although a heavier oil than specified above could be used here, it is strongly recommended that the same kind of high grade spindle oil be used all the way through.

## TAILSTOCK:

Oil the screw and nut with spindle in knock-out position, as the oil cup on top of tailstock body then lines up with oil holes in the spindle and the nut, allowing oil to reach the screw. Oil feed screw ball thrust bearing through oil cup on the spindle.

## CARRIAGE:

Oil tool post slide when it is all the way in, as the oil will then reach the screw and nut. The oil cups on top of the carriage lead the oil to felt filled chambers for keeping the proper surfaces constantly oiled. Fill these cups occasionally or whenever bed has been wiped dry. Use oil specified in all oil cups.

## BED:

All bearings are anti-friction. They are greased and sealed and do not require additional lubrication.

## MOTOR AND COUNTERSHAFT BEARINGS:

These bearings are ball bearings and should be greased from once a week to once a month, depending on their running time.

**NOTE:** Too much grease will cause overheated bearings.

## RECOMMENDED OILS

TRADE DESIGNATION:	SUPPLIED BY:
"Texaco Spindle Oil B"	The Texas Company
"Spino No. 38"	Standard Oil Company of New Jersey
"Gulfgem Oil C"	Gulf Refining Company

